

N V Timofeeff-Ressovsky in Germany (July, 1925–September, 1945)

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1. Introduction

Many books and articles about the outstanding Russian geneticist, biophysicist and radiobiologist Nikolai Vladimirovich Timofeeff-Ressovsky have appeared during the last few years, including a brief account in this journal (Korogodin *et al* 2000). But not all periods of his life have been covered equally, and only recently has his stay in Germany been written about. Documents that are now being made accessible allow a more complete study of his achievements and life in those two decades. With their help one can attempt a rational analysis of the life and scientific development of N V Timofeeff-Ressovsky.

Timofeeff-Ressovsky was among the earliest scientists to study microevolution, pleiotropy, penetrance and expressivity. Indeed, the last two words were coined by him. These studies, initiated in Russia in the early 1920s, revealed that several genes can influence the same characteristics, such as fecundity, and the combined action of two mutant genes cannot necessarily be predicted by their action when only one is present (Timofeeff-Ressovsky and Timofeeff-Ressovsky 1926). Thus, geneticists came to the understanding that the genetic variability of populations should not be viewed as a consequence of independent and noninteracting entities but as an integrated cohesive whole. N V Timofeeff-Ressovsky established that much of the genetic diversity in a wild population is hidden in the form of recessive mutations. His paper published in 1927 was the first proof of the existence of a significant amount of cryptic genetic polymorphism (Timofeeff-Ressovsky and Timofeeff-Ressovsky 1927). Timofeeff-Ressovsky was a pioneer in the field of evolutionary and developmental genetics, to a large extent with the fruit fly *Drosophila* as the system of interest. He learnt under S S Chetverikov, who, among other things, was one of the founders of population genetics. In his own words, “. . . in the early 1920s, the group headed by S S Chetverikov

at the Institute directed by N K Kol'tsoff organized a group for joint discussion of . . . the most important literature on problems of interest. Soon, when *Drosophila* became the main experimental object, this group was called “Drozsoor” (from Russian), which means “joint shouting of Drosophilists”. A deep interest in the phenomenon of mutation characterized his entire scientific career.

The most productive period of his life was in Germany. The German period should be considered as central in the life of Timofeeff-Ressovsky. It was the time of his fantastic scientific rise, which saw the transformation of a talented young researcher in genetics to a scientist of international calibre. Here he published approximately 140 out of 200 scientific articles. These articles were published in many countries, brought him global glory and created the methodological base for his subsequent scientific work. In 1950 he was nominated by B N Rajewsky, Director of the Berlin Institute of Biophysics, for the Nobel Prize in Physiology or Medicine.

Despite the numerous difficulties which he experienced and went through in Germany, these years were the most fruitful and bright period of his life: according to his own statement, “the most wonderful years of his life”. In Germany he managed to bypass those Soviet circumstances which not only interfered with the development of genetics, but also would lead him into an almost inevitable clash with authority. By living in Germany, for many years he personified Russian genetics in the West. It was a time when in the Soviet Union genetics was in the beginning of losing its vitality before it was to be temporarily destroyed by Lysenkoism.

2. Background

In the years 1923–1925 Nikolai Vladimirovich worked as an Assistant in the Institute of Experimental biology

headed by the famous scientist and naturalist N K Kol'tsoff. During these years he displayed independence and depth of thinking, besides coming up with appreciable scientific results. He was already the author of several scientific articles which are recognized now as classics (for example, the one announcing the concepts of pene-trance and expressivity). He was both a talented exper- imenter and a theorist. He knew German, French and a little bit of English. In 1923–1925, the well-known Ger- man neuropathologist and neuromorphologist, Professor Oskar Vogt, Director of the Brain Research Institute of the Kaiser Wilhelm Society in Berlin, lived in Moscow. Professor Vogt was a consultant to V I Lenin. After Lenin's death, at the request of the Soviet government, Vogt or- ganized the Brain Institute in Moscow to study Lenin's brain.

Vogt addressed the People's Commissar of Public Health services N Semashko with a request to recommend a tal- ented young Russian with a proven record in the area of genetics to work in Germany. At this time genetics in Germany was not well developed, but had reached a high level in Russia. Therefore Vogt, wishing to create in his Institute a department of genetics, searched for experts in Russia. He was interested in genetic problems dealing with the functioning of the brain. Semashko passed on Vogt's request to Kol'tsoff, and Kol'tsoff named his pupil Timo- feeff-Ressovsky. Vogt met Nikolai Vladimirovich and was pleased with the conversation. After some hesitation the young Timofeeff-Ressovsky accepted the offer. For him the opportunity to go to Germany meant independent scientific work. He felt that he would be more free and unchained than in his own country, which was rather far from democracy. Simultaneously he also tasted pride. "When I went for work to Germany I was proud of it, proud that this time the Germans came to us, instead of us to them". Together with him his wife Elena Aleksan- drovna, also a talented biologist, and son Dmitry (born in 1923), went to Berlin. The registration of the trip took place in March–May 1925 and proceeded with consid- erable difficulties. In Moscow the authorities thought it possible that a foreign scientific trip might presage the permanent departure of a politically unreliable scientist; and in Berlin the authorities were afraid to accept Soviet citizens, suspecting them of being spies or communist propagandists. Kol'tsoff managed to overcome the diffi- culties in Moscow. He convinced the authorities that the trip "will be very useful for the establishment of connec- tions between Russian and German science". Vogt wrote about this to the German authorities, hinting at anticom- munist tendencies in the scientist and his wife and men- tioning her German ancestry. On May 10 N V Timofeeff- Ressovsky received a traveling certificate and on June 10, 1925, a foreign passport was given to his spouse. At the end of June, Timofeeff-Ressovsky and his family

went to Berlin by train. Their work in Institute of Brain Research began on July 1. In the traveling certificate, only one year of leave to work in Berlin had been granted; Vogt wanted a longer term to be permitted. Eventually the terms were changed to 20 years.

3. Assistant in the Institute of Brain Research (July 1925–end of 1929)

The institute was founded on January 23, 1915 with the support of the Krupp family and belonged to the Kaiser Wilhelm Society. In the beginning Timofeeff-Ressovsky was supposedly "an assistant of the Institute of Brain Research"; actually, for some years, he headed a small genetics laboratory in the institute. It consisted of three rooms located on Magdebürgerstrasse 16, from July, 1925 till November 1928. Timofeeff-Ressovsky lived in Ste- glitz, a picturesque suburb in the south of Berlin. Here, there were many parks and installations for sports. At this time his salary was small, and it was necessary to save money. The daily life of Timofeeff-Ressovsky in those days is described in the memoirs of the Russian artist O Tsinger. In April, 1927 a second son, Andrei, was born to the Timofeeff-Ressovskys. Elena Aleksandrovna had been busy with domestic affairs, and also worked in labo- ratory where genetic research was carried out under the direction of her husband and some German employees. In 1926 the Russian geneticist S R Tsarapkin came from Moscow. Timofeeff-Ressovsky organized work in his



Figure 1. Young N V Timofeeff-Ressovsky in Germany.

laboratory in such a way that there were no formal restrictions for research. The researchers could come in at any time within the day, having notified him about it. “Every one with me worked on *Drosophila*. All of them more or less mastered genetics on the fundamental scientific level, providing them a knowledge base that could be of use in any life science”.

Indicative of the range of his interests, a charming paper from this period deals with the behavioural ecology of *Drosophila* (Timofeeff-Ressovsky and Timofeeff-Ressovsky 1927).

In it, the Timofeeff-Ressovskys presented the results of their observations of the distribution and activity patterns of different *Drosophila* species in the Berlin-Buch area over a 24 h period and over different seasons. There was a circadian rhythm of activity with, interestingly, two peaks, one in the morning (about 8 am) and one late in the evening (about 9 pm). Further, “. . . [the observations] show that all four species have the two characteristic activity peaks in the morning and the evening; but in the case of *Drosophila funebris* the higher peak is in the morning, whereas all the other *Drosophila* species [exhibit it] in the evening”.

It was a time of intense experimentation and theoretical analysis; he slept for only five hours a day. By the end of 1929 he had published 15 articles in German, American and Soviet scientific journals on key problems of genetics and experimental biology and approximately as many in the following two years. These articles summarized fundamental results of the study of effects of temperature and irradiation on the variability of genes and their functioning.

Till 1930 he was formally a member of the staff of the Moscow Institute of Experimental Biology and published articles in its journals on a regular basis. He had close contacts with Soviet scientists who frequently visited Berlin. They included N K Kol'tsoff, V I Vernadsky, N I Vavilov, A S Serebrovsky, J A Filipchenko, G A Levitsky, G D Karpechenko, S G Levit, S S Chetverikov and many other researchers. Discussions with them enriched the young scientist intellectually. He had extensive communications with his Moscow colleagues. He helped them to publish articles in German journals, translated their texts into German, informed them about publications in the field of genetics in Germany and exchanged reprints of articles with them. But during this period



Figure 2. N V Timofeeff-Ressovsky and his co-workers in the greenhouse, Institute of Brain Research, Berlin-Buch, early 1930s.

(1925–1929) his position in the institute was unstable. He was not sure whether his stay would be prolonged. He thought of returning to Russia, even looked out for a place to work. But events were to change his life and plans significantly.

4. Head of the Department of Genetics (February, 24, 1930–March, 31, 1937)

In second half of 1928, construction of a new six-storey building of the Institute of Brain Research in a suburb of Berlin had started. A cemetery should have been created here, but the ground appeared improper. Timofeeff-Ressovsky and Tsarapkin, with their families, had gone there already by the end of 1928. They stayed there for a year and were involved in the construction of greenhouses for a department of genetics. By February 24, 1930 construction of the new building of the institute was completed. One journalist wrote at the end of this year: “At last, the Institute of Brain Research has a genetics department. In it some groups of insects are studied to elucidate the mechanisms of heredity, which is usually neglected but is necessary for understanding the features of brain structure, as well as in general for the development of a theory of the structure of an organism”.

Vogt suggested that Timofeeff-Ressovsky become the head of the Department of Genetics, and the Russian scientist agreed. This offer opened for him the broadest opportunities for scientific research and analysis of key problems of genetics. He retained his Soviet passport and could return to the USSR at any moment. But the desire decreased after he learnt about reprisals against scientists in the Soviet Union and about the rumors circulating in Moscow about his ostensibly illegal stay in Germany.

His scientific prestige rose high with his publications in Germany, the USA, Great Britain and in other countries. In May, 1931 Timofeeff-Ressovsky was invited to the plenary session of the VI International Congress of Genetics in Ithaca, and then to work for some months in the Cold Spring Harbor Laboratories of the Carnegie Institute in New York. In Ithaca at the end of August 1932 the elite of genetics, including Thomas Hunt Morgan, Nikolai Vavilov and Herman Muller had gathered. Timofeeff-Ressovsky had entered this elite. His report on genetic mutations was included in the book published after the congress. Soon after the congress the future Nobel Prize winner Herman Muller worked in the Department of Genetics in Berlin-Buch for a few months. In a statement to the Council of Trustees of the Institute of Brain Research on July, 6, 1933, he was highly appreciative of the department headed by Timofeeff-Ressovsky: “I should use the opportunity presented to me to state my approval of the work of the genetics department of this institute... I believe that it is necessary to welcome

further work on the chosen directions, which are progressing in an extremely successful way, and I believe that soon we can apply results of this work directly to human research”. This statement, together with the “Report about work with neutrons and artificial radioactive isotopes” made by Timofeeff-Ressovsky, and other recently published documents reveal the basic directions of his work in Germany.

Concerned that the Americans could persuade him to move there, Vogt undertook vigorous actions to conclude a long term contract before the visit of Timofeeff-Ressovsky to the USA. It was signed in the beginning of 1932. This contract was for three years with a subsequent automatic prolongation. Now Timofeeff-Ressovsky received the salary of an extraordinary university professor. The contract played a big role in his future: without it, it could have been very difficult to keep his position. Since July 1925 Vogt was the only support of Timofeeff-Ressovsky. But after Hitler took over power on January 30, 1933, position of Vogt became unstable. In May 1935 the Nazis insisted on his resignation from the Position of the Director of the Neurobiology Institute of Berlin University. Vogt’s resignation accepted on May 12, 1936 at a session of Council of Trustees of the Institute. From March 31, 1937, there was a new director, the neuropathologist Hugo Spatz, a staunch Nazi supporter. In the spring and summer of 1936 rumors about the dismissal of the Russian scientist and about his moving elsewhere were spreading. Spatz said that he did not want to deal with Russian scientists and named the Department of Genetics “an alien body” in the Institute. The dismissal was prevented only thanks to the efforts of Vogt. He convinced the leaders of the Ministry of Science and Education of the necessity to maintain the Department of Genetics, which was recognized by the international scientific community. It was decided that Timofeeff-Ressovsky would continue to be the Head of the Department, but the Department would be excluded from the body of Institute and reorganized as a unit of the Kaiser Wilhelm Institute directly under the supervision of the Kaiser Wilhelm Society. After this Timofeeff-Ressovsky gained full scientific and administrative independence and became completely engaged in basic research in genetics. He had managed to overcome all his problems only because of his high scientific prestige in Germany. In 1933–1937 about 45 of his articles appeared in various journals.

In 1934 he published a review entitled *The Experimental Production of Mutations*; it is acknowledged to this day as a classic. The article begins with the sentence “The possibility of influencing, or even directing, the heritable variability of organisms is unquestionably one of the central problems of biology”. The entire field of radiation genetics (as it was in 1934) is surveyed. Towards the end, while alluding to the power of short-wave

radiations to induce mutations, Timofeeff-Ressovsky goes on to use (perhaps to coin) a phrase which is much in vogue today, “genetic engineering”.

In 1935 Timofeeff-Ressovsky, Max Delbrück and Karl G Zimmer published another classic article, “*On the Nature of Gene Mutation and Gene Structure*”. The principal discovery was the observation, in *Drosophila*, of a linear relation between the total radiation dose and the number of mutations. Whether the dose was administered in a single shot, or in several fractions or continuously at a low level over an extended period, appeared irrelevant. The intensity of the dose did not affect the number of mutations produced. Also, there was no minimum dose below which mutations were not generated. These observations suggested that X-rays produced mutations like particles hitting targets. The idea of hitting was formulated as the act of interaction of a quantum of energy (or particle) with a target. The target is a region (or structure of a cell) in which the hitting, within it, of an ionizing particle could produce a mutation. With the usage of these principles and with mathematical modelling of the “dose-effect” curves, the size of a gene (or the size of a minimal target which ionization inactivated in a gene) was estimated. It was found to be a volume consisting of approximately 1000 atoms.

This article influenced the development of two new fields of science, biophysics and molecular biology. The German physicist Georg Graue wrote in the summer of 1938, “From a scientific point of view Timofeev is undoubtedly one of the best geneticists. Foreign visitors and colleagues investigating the same problems, who came to Berlin, would make it a point to visit him. His scientific reputation was confirmed and he was also invited to make reports in numerous scientific congresses”.

5. The years preceding the war (April 1937–June 1941)

On May 5, 1937 Timofeeff-Ressovsky wrote to the Soviet embassy in Berlin and requested permission to extend his and his family’s stay abroad. The request was rejected. His decision, not to come back in the USSR in May 1937, was the right one. Arrest and punishment awaited Timofeeff-Ressovsky in his Fatherland. Moreover, returning could harm his colleagues – primarily Kol’tsoff, who had organized the visit to Germany.

Soon it was necessary to make another resolve. On July 5, 1938, the minister of science and education, Bernhard Rust, after being informed that Timofeeff-Ressovsky had been elected to the Society of Advancement of Sciences, proposed that he adopt German citizenship. Timofeeff-Ressovsky politely refused this honour. The refusal could have had serious consequences. Once again he was saved

by his highly respected colleagues. But his scientific career in Germany was frozen. Now it was necessary to search for funding, and overcome difficulties to get formal permissions from German authorities for visits abroad.

Since April 1937, Timofeeff-Ressovsky had spent a lot of time on financial and administrative issues of the Department of Genetics. His co-workers were very nice to him and respected him sincerely. They appreciated his sociable character and readiness to help. In spite of the administrative chores he was obliged to carry out as the head of the department, his scientific output did not decline. Between the spring of 1937 up to the middle of 1941 he published more than 40 articles. He presented his achievements at many German and international scientific forums and participated in the well-known seminars organised by Niels Bohr at Copenhagen. He describes this phase thus: “I had a chance to take part in seminars of the Bohr Circle in Copenhagen. Besides, I organized in coordination with B S Ephrussi (with the financial support of the Rockefeller Foundation) a small international group of twenty scientists, among whom were physicists, chemists, cytologists, geneticists, biologists and mathematicians, who were keen on discussions of the most vital problems in biology. The members of the group gathered at lively sea resorts in Denmark, Holland and Belgium in the end of the 30s, before the war”.

He was elected to the German Society of Genetics, the Ornithological Society (Ornithologische Gesellschaft), the Biophysical Society, the Society of Medicine and Natural History, and the German Zoological Society. In 1937 he addressed the International Congress on Physics, Chemistry and Biology in Paris on the theme “Obtaining of mutations and the structure of a gene”. Also in 1937, the Rockefeller Foundation invited him to consider heading the Laboratory of the Carnegie Institute at Cold Spring Harbor, but he refused. On April 22, 1938 he was elected as an honorary member of the Italian Society of Experimental Biology, and on April 20, 1940 to the Academy of Sciences ‘Leopoldina’ which had elected outstanding researchers as members since the 17th century. Nikolai Vladimirovich was included in the team of the German delegation to the VII International Congress of Geneticists which was held from August 23 till August 30, 1939 in Edinburgh. Here he was elected to the editorial board of the Congress.

6. During the second World War

Obviously, the second World War affected the life and research of Timofeeff-Ressovsky. Due to war conditions, possibilities of taking part in scientific symposia and fora disappeared. The operating conditions of the Department

of Genetics also worsened. Nevertheless, according to the index of his works, in 1941–1945 he published 12 articles. To get funding for basic science was hard. It was difficult to protect the employees of a department, among whom there were Frenchmen, Russian, Bulgarians, Chinese, displaced persons and prisoners of war, from prosecutions by the Gestapo. At high personal risk and by risking his family, Timofeeff-Ressovsky employed displaced persons, emigrants, and fugitives to prevent their extermination by the Nazis.

After June 22, 1941, when the German army invaded the USSR, the position of Timofeeff-Ressovsky became even more complicated. The Nazi authorities' suspicions of the Russian scientist became more and more obvious. In the summer of 1942 he was refused permission to vacation with his family on the Baltic coast. On July 1, 1943, his older son Dmitry was arrested. He was a member of the "Berlin Committee of the Communist Party", an underground antifascist organization, which included displaced persons from USSR and other countries. On May 1, 1945 Dmitry died in the concentration camp at Mauthausen. During the war there were denunciations of Timofeeff-Ressovsky and he was shadowed, but not arrested. "They did not touch Timofeev because his glory was great; it was impossible", remarked R Rompe. In the

first half of February 1945, because of the offensive of the Soviet Army, the director of Institute of Brain Research, Hugo Spatz, decided to transfer the Institute to the southwest of Germany. Timofeeff-Ressovsky had other plans. He wanted to return to the USSR and to put his Department at the disposal of the Soviet Union. He fully realised that this could be a dangerous step for him personally.

7. Director of Institute of Genetics and Biophysics (April 21–September 12, 1945)

The Soviet Army advanced to Buch on April 21, 1945. I B Panshin recollects: "I and many employees of the Institute were in Timofeeff-Ressovsky's house. There was sporadic shooting. I saw our soldiers from the window. I went to them with a self-made white flag of surrender. On the whole, everything took place peacefully". Timofeeff-Ressovsky and Panshin sent two telegrams to Moscow. "One of our first actions was sending a telegram to Stalin stating that it was necessary for us to serve in the Soviet Union and that the Institute with the staff and the equipment would be very valuable for Russia. The second telegram with the text was sent on the following day".



Figure 3. N V Timofeeff Ressonvsky, Herman Muller and Cyril Darlington in Edinburgh in the second half of the 1930s.

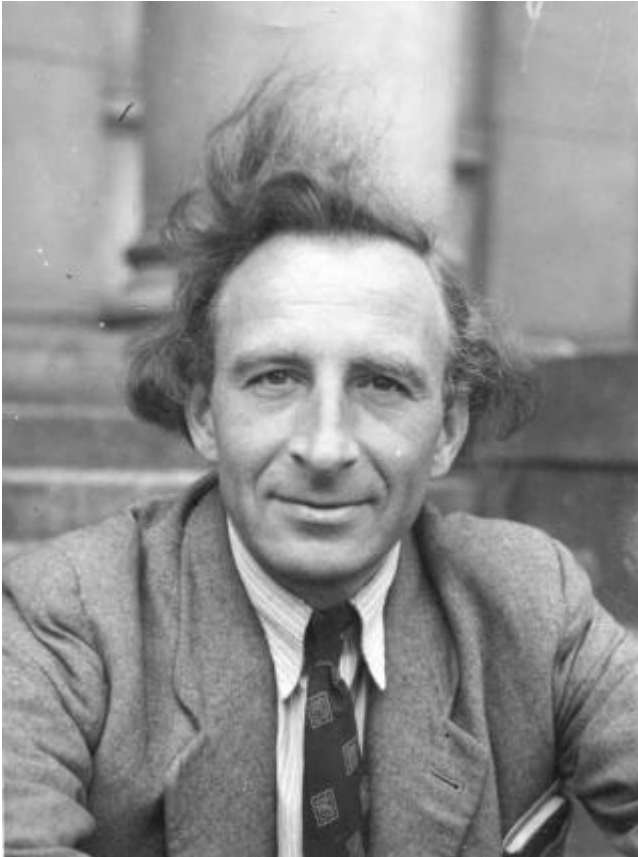


Figure 4. N V Timofeeff-Ressovsky in Berlin-Buch 1943.

Probably because of these telegrams, initially the consequences were positive. The Soviet command, having realized its scientific and practical importance, received orders to protect the Institute and for its subsequent transportation to the USSR. The decision was that Timofeeff-Ressovsky must continue his research until further notice. The Department of Genetics passed to the command of the Soviet Army, and Timofeeff-Ressovsky was appointed by the Military Council of the First Belarussian Front as Director of Institute of Genetics and Biophysics, as it came to be named. He was obliged to take care of the equipment and staff. The step was preceded by a screening of all employees of the Institute by the military counter-intelligence of the Third Army. This took place from April 23 to April 27 and was accompanied by long interrogations during which Panshin was arrested. The others were released and started work at once. In these new conditions too, Timofeeff-Ressovsky took good care of the employees. He provided meals for them and their families and documents and certificates to protect them from arrest by the Soviet military authorities.

Research continued together with preparations to transfer the Institute's equipment to the USSR, which proceeded

at high speed. The Institute was constantly examined by various commissions which included known Soviet scientists; the commissions' interest was in using the Institute for a project on the creation of an Atomic bomb by the Soviet Union. Three of the most talented colleagues of Timofeeff-Ressovsky, A Katsch, Karl Zimmer and H-J Born, were sent to the Soviet Union in the autumn of 1945. Nikolai Vladimirovich would also have been recruited to the A-bomb project, but he was busy in preparations to send the equipment and employees of the institute to the USSR. At the height of this work, on the night of September 12–13, 1945, Timofeeff-Ressovsky was arrested. O Tsinger recollected: "One evening, at about one o'clock in the morning or later, I stood in the kitchen of our apartment, seeing whether it was possible to quickly gobble something. Suddenly I heard the rustle of automobiles and saw a huge black Mercedes which stopped directly before our open door. Three men got out of the vehicle and were directed directly to me. "Do you know where Professor Timofeeff-Ressovsky lives?" I led them to the Torhouse. Kolyusha [their familiar name for Timofeeff-Ressovsky] had not slept yet, and I told him that there were three persons who wanted to talk to him. Kolyusha went to them, and the three who had come very kindly asked him to go with them to Berlin for some conference. They promised to bring him back in an hour or so. "Well, I shall go to sleep", I told Kolyusha, "tomorrow we shall have supper together". After that we did not hear again about Kolyusha until two years later, and I did not see Kolyusha again at all!. In two weeks Timofeeff-Ressovsky was sent to Moscow. A new and a very difficult period of the biography of this scientist began. But that is the subject of another story.

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